Program/Abstract #502
Indirect development and the bilaterian body plan
Cesar Arenas-Mena
College of Staten Island/City Univ. of NY Biology, Staten Island, NY, USA

The characterization of indirect development in marine invertebrate embryos challenges major assumptions in metazoan body plan evolution. The synexpression of transcription factors in indirectly developing sea urchins, polychaetes and cnidarians during embryogemesis suggests that indirect development by means of a ciliated larva is ancestral in eumetazoans, and that the syncytial "endoderm" of acoelomorph flatworms and the epibolic gastrulation of direct developers are derived. The histone variant H2A.Z is associated with transcriptional multipotency in indirectly developing sea urchins and polychaetes. Adult development of indirect developers is not entirely reliant on multipotent 'set-aside' cells. The redeployment of H2A.Z in differentiated larval regions known to contribute to adult organs of the polychaete *Hydroides elegans* also suggests a role for this histone in transdifferentiation, a process that is generally considered exceptional among direct developers. It is proposed that development through partial dedifferentiation represents the ancestral developmental mode of metazoans, and that stem cells represent a developmental shortcut innovation. Thus, the evolution and ontogeny of indirect development seems more continuous than indirectly developing echinoderms would suggest. The genomic organization and usage of the Hox cluster in indirect developers also suggests an ancestral association with the feeding-dependent development of the reproductive side of metazoans, which proceeds by terminal growth in bilaterians. This is in contrast with the prevailing assumption of an ancestral role of the Hox cluster in anteroposterior diversification, which would represent a secondary cooption.

doi:10.1016/j.ydbio.2011.05.564

Program/Abstract #503
Wnt signaling promotes oral fates during regeneration and embryogenesis in the cnidarian *Nematostella vectensis*
Michael Trevino, Shane Harmon, Patrick M. Burton
Wabash College Biology, Crawfordsville, IN, USA

Although all metazoans display axial polarity during development, the evolutionary origins of the mechanisms underlying this polarity remain poorly understood. Recent work has identified a conserved role for the canonical Wnt signaling pathway in patterning of the primary axis across a wide variety of taxa. Much of the data now available from non-triploblastic animals originates from study of non-embryonic modes of development, yet the relationship among embryonic and adult (e.g. regeneration) developmental modes is unclear. Using beta-catenin as a marker, we investigated the role of the Wnt signaling pathway during both regeneration and embryogenesis in the cnidarian *Nematostella vectensis*. Induction of Wnt signaling with alsterpaullone results in ectopic oral tissue development during both regeneration and embryogenesis. The specificity of these effects is demonstrated by upregulation of beta-catenin, as measured by qRTPCR. Our data indicate that canonical Wnt signaling is responsible for oral patterning across Nematostella developmental modes. When interpreted in the context of data from other cnidarians, these results suggest that the Wnt/beta-catenin pathway may have been involved in patterning the primary body axis of the anthozoan–medusozoan common ancestor, and that this signaling module has been recruited to pattern the oral–aboral axis in multiple developmental contexts within Cnidaria. Our data also contribute to a growing body of literature indicating a conserved role for patterning mechanisms across the various developmental modes of metazoans.

doi:10.1016/j.ydbio.2011.05.565

Program/Abstract #504

Program/Abstract #504 will be presented as scheduled, but the abstract cannot be published due to lack of license agreement between authors and publisher.

doi:10.1016/j.ydbio.2011.05.566

Program/Abtract #505
Spatial expression patterns of delta, gcm and brachyury in the cidaroid sea urchin *Eucidaris tribuloides*
Hyla Sweet, Deepika Sharma, Rae Ann Covington, Alicia Wooten, John Bednarz
Rochester Inst of Tech Dept of Biol Sci, Rochester, NY, USA

Cidaroid and euechinoid sea urchins diverged approximately 250 million years ago. Important differences seen in the development of cidaroids include slower overall development, delayed skeletogenic cell development, and variable number and size of micromeres compared to euechinoids. The purpose of this project is to initiate a study to compare the spatial expression of several important genes between cidaroids and other echinoderms with a goal of explaining the developmental differences seen between these groups. Previous studies with euechinoid sea urchins have shown that delta is expressed by micromere descendants in the vegetal plate, macromere descendants in the vegetal plate and archenteron, pigment cells, and cells in the apical region. In cidaroids, delta is expressed by very few cells in the vegetal plate, possibly pigment cells, and cells in the ciliary band. Expression in the apical region and in the ciliary band suggests a possible role for Delta/Notch signaling during neural development. In the euechinoid sea urchins, previous studies have shown that gcm is expressed in the vegetal plate, the tip of the archenteron, and pigment cells. In cidaroids, gcm is expressed in similar cell types, but also within the coelomic pouches. Coelomic pouch expression suggests a possible role for GCM beyond pigment cell specification. Brachyury has been found by others to be expressed in cells at the base of the archenteron and in the oral ectoderm in euechinoids. The cidaroid expression of brachyury is very similar. Overall, the cidaroid expression patterns of delta, gcm and brachyury are similar to what has been shown in euechinoid sea urchins but delta and gcm have some striking differences as well.

doi:10.1016/j.ydbio.2011.05.567

Program/Abstract #506
Breaking symmetry in early embryos of *Platynereis dumerilii*
Stephan Schneider
Iowa State University, Ames, IA, USA

Embryonic development shapes the size of subsequent morphological features e.g. of larvae and/or adults by specifying areas and/or progenitor cells of different size and fates. Spiralian embryos accomplish these by highly stereotypic and invariant asymmetric cell divisions. In Platynereis embryos each embryonic cell can be already identified by its size and position within the embryo. Here we report the cell lineages of the four animal-pole daughter cells from an eight cell stage embryo, the micromeres 1a, 1b, 1c, and 1d until the